Factors contributing to Platypus mortality in Victoria

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Abstract

Of 124 Platypus mortality records from the 1980s to 2009 where the cause of death could be reliably assigned, 41% were deemed to be due to animals drowning in nets or traps set to capture fish or freshwater crustaceans, with fyke nets and opera house traps mainly responsible for Platypus deaths since 2000. By comparison, 26% of mortality records were ascribed to natural causes (predation by raptors and canids, flooding and drought), though natural causes were almost certainly under-reported. Other important factors contributing to mortality included litter and fishing hooks (14% of mortality records), man-made structures such as irrigation gates and pumps (10%) and motor vehicles (4%). (*The Victorian Naturalist* 127 (5) 2010, 178-183).

Keywords: Platypus, mortality factors, illegal netting, litter entanglement, effect of floods

Introduction

Platypus Ornithorhynchus anatinus have been documented to be preyed upon by a variety of species, including wild Dog Canis familiaris and Fox Vulpes vulpes (Brown and Triggs 1990), Spot-tailed Quoll Dasyurus maculatus (Dawson et al. 2007), Tasmanian Devil Sarcophilus harrisii (Munday et al. 1998), White-bellied Sea-Eagle Haliaeetus leucogaster (Munday et al. 1998; Seale 2008), Wedge-tailed Eagle Aquila audax (Rakick et al. 2001), Grey Goshawk Accipiter novaehollandiae (Richards 1986) and Carpet Python Morelia spilota (Burrell 1927). The earliest evidence that Platypus were hunted for food by Aborigines consists of bones found in Tasmanian caves occupied between 13000 and 30 000 years ago (Marshall 1992).

Following European settlement, many Platypus were killed for sport or as a source of fur. For example, a self-styled 'naturalist' named Bob Stuart reportedly made a fairly good living in the 1870s by selling the skins of Platypus trapped or shot along Darebin and Merri Creeks and nearby parts of the Yarra River, in what are now Melbourne's inner suburbs (Ward 1966). More recently, factors contributing to Platypus mortality include floods (Grant 2007), litter entanglement (Serena and Williams 1998), being shot (Munday et al. 1998), run over by motor vehicles (Tyson 1980; Taylor et al. 1991; Otley and le Mar 1998) or injured after entering power plant intakes (Munday et al. 1998), becoming wedged in narrow pipes (Taylor et al. 1991), drowning in fish nets and yabby traps (Munday et al. 1998) or after becoming snagged on fish

hooks (Grant 2007) and dying in rabbit traps (Burrell 1927). However, to date, only one study has assessed the relative importance of different mortality factors. Based on necropsies of 25 carcasses carried out in Tasmania in the mid-1990s, Connolly et al. (1997) concluded that 40% of Platypus deaths were due to attack by dogs, 28% were caused by motor vehicles, 16% were attributable to starvation and/or exposure (including one animal that had been washed downstream by flooding) and 8% were due to infection by Mucor amphibiorum, a fungus linked to disease in Tasmanian Platypus but not animals living on the Australian mainland. The cause of death could not be reliably assigned in the remaining 8% of cases.

Factors implicated in contributing to Platypus mortalities in recent decades in Victoria are reported here, based mainly on carcasses discovered fortuitously by a wide range of informants. In addition, data relating to the effect of flooding on Platypus was obtained as a by-product of live-trapping surveys carried out by the authors in and around Melbourne from 2001 to 2006.

Methods

From 1989 to 2009, the authors recorded details of 174 first-hand verbal reports of Platypus mortalities, including 23 cases in the 1980s, 60 in the 1990s, and 91 in the 2000s. The reports were provided on an ad hoc basis by veterinarians, biologists, natural resource managers and members of the public. Most reports (71%) were provided within 4 weeks or less of a carcass being found or death(s) otherwise being documented. Whenever possible, informants supplied photographic documentation of the remains (n = 39) or held them until the remains and the place where they were found could be examined by Australia Platypus Conservancy staff (n = 41).

Platypus live-trapping methods used to provide information relating to the effects of flooding on Platypus survival have previously been described in Serena (1994) and Easton *et al.* (2008).

Results

Factors contributing to death were not assigned in 50 cases due to inadequate evidence, i.e. Platypus remains were found without any compelling indication as to how the animal(s) died. The remaining 124 cases were attributed to a diverse range of agents and events, broadly grouped into 10 categories (Table 1).

Illegal nets and traps

In 41% of the cases where cause of death could be reliably identified, animals drowned in nets or traps set to capture either fish or edible crustaceans such as Yabbies (Cherax spp.) or Spiny Crayfish (Euastacus spp.). Many of these incidents involved multiple Platypus mortalities. For example, in the mid-1990s reservoir management staff found at least eight carcasses tangled in a pair of rectangular mesh gill nets (each c. 10 m long) lying next to Cairn Curran Reservoir near Welshmans Reef Caravan Park (confirmed by photographic evidence). The nets presumably had been attached to nearby dead trees standing in the water and were abandoned after they had been discovered to have killed protected wildlife as well as fish. Among reports received since 2000, the authors confirmed that 17 Platypus skulls were contained in a single unlicensed fyke (or eel) net set and then abandoned along a small stream in the Gellibrand River catchment, and five carcasses were discovered by a state wildlife officer in a pair of licensed fyke nets set about one km upstream of the area legally allocated to commercial eel fishing along the Tarra River. Up to three animals at a time have reportedly died in a single enclosed yabby or cray trap when a landowner reported finding 'one very large and two smaller' individuals drowned in an opera house net set in the Tarago River in 2006.

Drum nets and enclosed yabby/cray traps each were involved in one-third of incidents

Predation

Nearly one-fifth of Platypus mortality reports were related to predation. Carcasses were found 8 to 100 m from the nearest water body (55 \pm 24 m, mean \pm S.D., n = 15), presumably having been carried from the water's edge after being killed. Three carcasses had wounds that appeared to be caused by a raptor's talons and/ or bill. The remaining 21 deaths were attributed to canids (dogs or foxes). Most commonly, this was based on severe thoracic bruising and broken ribs being recorded along with puncture marks corresponding to a canid's canine teeth (n = 4), or a crushed skull and/or broken neck occurring in conjunction with tooth puncture marks (n = 12). In addition, one partially eaten carcass was found buried in a pile of sand (with fox tracks and evidence of digging activity observed at the site the morning after the carcass was removed), one partially eaten carcass was found close to a Fox den, and three partially eaten carcasses were recovered in association with fresh canid scats and/or tracks.

Juveniles (< one year old) appear to be more vulnerable to predation than older animals. Of 16 carcasses that could be assigned to an age class based on the size and appearance of spurs located on a platypus's hind legs (Temple-Smith 1973), six individuals were classified as adults or subadults (3 males, 3 females) and 10 as juveniles (4 males, 6 females). Interestingly, mortalities due to predation were recorded in every month from November through June but not July, August, September or October. This presumably reflects the fact that unregulated Victorian streams and rivers typically flow most strongly in winter and spring, helping to protect Platypus from land-based predators.

Man-made structures in channel

Thirteen mortality reports (10% of the total) were related to animals drowning after encountering man-made structures. A large proportion of these reports (n = 8) involved a Platypus entering an irrigation pump, with cases recorded along the Thomson and Murray Rivers

Table 1. Factors deemed to be responsible for Platypus mort	talities in Victoria from the 1980s to 2009
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Mortality factor	No. of incidents (%)	No. of animals (%) 103 (56%) 24 (13%) 19 (10%) 10 (5%) 7 (4%) 5 (3%) 5 (3%) 4 (2%) 3 (2%)	
Illegal nets Predation Structures in channel Angling Litter Flooding Motor vehicles Shot or bludgeoned Drought Miscellaneous	$51 (41\%) \\ 24 (19\%) \\ 13 (10\%) \\ 10 (8\%) \\ 7 (6\%) \\ 5 (4\%) \\ 5 (4\%) \\ 4 (3\%) \\ 3 (2\%) \\ 2 (2\%) $		
Total	124	183	

Table 2. Temporal variation in the use of four types of nets or traps contributing to Platypus mortality in Victoria.

Net type	1980-1989	No. of mortality reports 1990-1999	2000-2009
Enclosed yabby/cray trap	2	2	7
Drum net	4	6	1
Fyke net	2	2	4
Gill net	1	1	1

in the 1980s and 1990s, and the Loddon, Yarra and King River catchments and lagoons associated with Gunbower Creek after 2000. Most landowners responded by fitting grates or the equivalent around the pump structure, but two or more animals died sequentially over time in the case of three pumps. In addition, one Platypus died after entering a small, privately owned hydroelectric turbine via an unguarded inlet, one died while attempting to negotiate a Dethridge wheel (used to monitor the delivery of irrigation water), one drowned after becoming lodged in a small pipe associated with a town water supply system, one drowned while attempting to squeeze through a narrow (c. 5 cm) gap between gates used to regulate flow between irrigation channels, and one drowned while attempting to negotiate two overlapping wire mesh panels used to trap incoming leaves at the upstream end of a small on-stream dam.

Angling

Ten reports (8% of the total) described animals dying as a direct or indirect by-product of angling. Three cases involved animals found dead at the water's edge with one or more loops of nylon fishing line wrapped tightly around the neck or torso. In each case, the line had cut

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deeply into underlying muscle and connective tissue. In addition, one animal was found dead on the banks of the Yarra River with a hook embedded in its lower bill, two died after becoming hooked on baited lines left unattended overnight (in the Rubicon and Wonnangatta Rivers) and four drowned after fishing line attached to a hook embedded in either a front foot (n = 3) or bill (n = 1) became tangled in submerged woody debris (in Lake Elizabeth, Mount Emu Creek and the Howqua and Murray Rivers).

Litter

Seven Platypus mortality reports (6% of the total) described animals dying after litter other than fishing line became wrapped around their body or limbs. One animal apparently drowned after its front and back legs on one side became shackled together by a twisted plastic six-pack holder (Serena and Williams 1998). The remaining cases involved loops of litter wrapped around the neck (n = 4) or bandolier-fashion from just in front of one shoulder to behind the opposite front leg (n = 2), causing deep lesions to develop. The items included a knotted loop of string, a child's plastic bracelet, a plastic cable-tie (circumference = 19.2 mm), and three

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plastic rings or loops (in each case, 2-3 mm thick) of unknown origin.

Floods

Five Platypus mortality reports (4% of the total) involved carcasses (two juveniles, three adults or subadults) discovered in the immediate aftermath of major flooding along the Werribee, Yarra, Ovens, Kiewa and Tanjil Rivers.

The fact that juveniles are weaker and less experienced swimmers as compared to older animals suggests that they are more likely to die in floods, particularly if these occur around the time they first emerge from the nesting burrow in late January to February (Grant et al. 1983). This hypothesis is supported by the results of Platypus live-trapping surveys carried out in the Melbourne area after more than 120 mm of rain fell on the city in less than 24 hours in early February 2005 (the highest one-day total since weather records began to be kept in 1855). The mean juvenile capture rate from February to June 2005 along Diamond, Mullum Mullum, Olinda and Monbulk Creeks and the lower reaches of the Plenty River was 0.02 animals per site per night, or less than 10% of the corresponding mean capture rate from 2001- $2004 (0.25 \pm 0.10, \text{mean} \pm \text{S.D.})$. In contrast, the capture rate for adults and subadults occupying the same five water bodies from February to June 2005 (0.38) was actually slightly higher than the corresponding mean capture rate from 2001-2004 (0.34 ± 0.14 , mean \pm S.D.). Juvenile recruitment appeared to recover in the following year, based on a mean capture rate of 0.20 juveniles per site per night recorded along the five water bodies from February to June 2006.

Road trauma

Five mortality reports involved animals being run over by motor vehicles. Two incidents occurred in the 1990s next to bridge culverts (located along the Watts River at Healesville and Happy Valley Creek at Myrtleford); the person reporting the Myrtleford mortality noted that other Platypus carcasses had been observed at the same location in previous years 'when the creek was running high'. In addition, a Platypus of unknown sex and age died in 2002 during a period of severe drought on a road near Rossbridge (in the Hopkins River catchment), a juvenile female was found dead in 2002 on a road located about 20 m from a drainage channel near Trafalgar (in the Moe River catchment), and a subadult male died in 2000 after being run over on a private driveway located near Monbulk Creek in Belgrave.

Attack by humans

Four Platypus mortality reports described animals dying after being targeted by humans. One incident involved an animal being shot by a man hunting rabbits along the Barwon River in the 1990s, after he saw bubbles rising in the water. Three other incidents involved animals (presumably unwary juveniles) being bludgeoned to death in shallow water by children or older youths armed with rocks or lumps of wood along Diamond Creek (Yarra River catchment) in the mid-1990s, the Campaspe River in 2003 and Broken Creek in 2004.

Drought

Three mortality reports described a Platypus being found dead (and not apparently killed by a predator) in or near a recently evaporated pool during a period of drought (in the Ovens River catchment in 2003, the Campaspe River catchment in 2004 and the Hopkins River catchment in 2006). These deaths presumably reflect the fact that Platypus are adapted to feed exclusively in the water and starve to death in the absence of adequate surface moisture.

Miscellaneous mortalities

One Platypus drowned in the mid-1990s in a bath tub used to water livestock (the smooth enamel surface apparently making it impossible for the animal to escape). In addition, two very young juveniles died in captivity in 2007 after being inadvertently unearthed from a nesting burrow by a large mechanical excavator working near a pumping station.

Discussion

Nearly three-quarters (74%) of cases where Platypus have been found dead in Victoria since 1980 (and the cause of death could be reliably identified) were linked directly to human activities or behaviour. Our sample almost certainly underestimated 'natural' sources of mortality such as predation, drought or flooding (for example, many victims of predators are presumably consumed entirely, and deaths related to drought are difficult to assign (or even record) if victims die of starvation in burrows or abandon isolated

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pools in search of larger water bodies). By the same token, our study only identifies factors implicated in direct mortality; the effects of environmental degradation, introduced species such as Carp (*Cyprinus carpio*) and modified flow regimes in reducing the Platypus's food supply or the extent of its habitat are not addressed. Nonetheless, our results suggest that Platypus survival rates may improve in at least some localities if the following human activities can be curtailed.

Use of illegal fishing nets, yabby/cray traps and fishing lines left unattended overnight

More than half of the deaths described in our records resulted from illegal use of set lines, drum nets, gill nets or (particularly since 2000) fyke nets and enclosed yabby or cray traps. We are particularly concerned that the incidence of Platypus deaths in opera house nets and other forms of enclosed vabby/cray traps appears to have escalated since 2000, even though it has been illegal since mid-2001 to use or possess such traps 'in, on or next to all Victorian inland public waters' (DPI 2009/2010: 66). Opera house nets and other enclosed frame traps can still be set legally in privately owned off-stream dams and ponds and are accordingly widely available for sale throughout the state. In 2009, industry sources estimated that around 100 000 opera house nets are purchased annually in Australia (B Doyle-Cox and B Parsons, pers. comm.). Based on these facts, we predict that enclosed yabby/cray traps will continue to be widely deployed in streams and rivers (and so will continue to drown Platypus and other wildlife) until such a time as their use is outlawed entirely. Safe alternative methods for the recreational harvesting of yabbies and crays are available in the form of baited lines, dip nets and collapsible hoop (or lift) nets.

Use of pumps and hydro-power turbines with entry points accessible to Platypus

A surprisingly high number (8%) of individual mortalities were due to a Platypus being killed after entering an irrigation pump or (in one case) a small-scale hydroelectric turbine. Fitting appropriately designed wire mesh guards or the equivalent around the entry points to all pumps and turbines would benefit landowners by reducing the incidence of blocked pumps as well as help to protect wildlife.

Allowing harmful litter to accumulate in the environment

Ten records described Platypus dying as a byproduct of becoming tangled in abandoned fishing line or other forms of litter. The recommendations outlined in Serena and Williams (1998) remain relevant: efforts by individuals or organisations to remove litter from the environment should be strongly encouraged, and everyone should make it their habit to cut through discarded loops or rings of any size (including such seemingly innocuous items as loops of twine, elastic hair ties, engine gaskets or the tamper-proof sealing rings found around food or beverage containers) before disposing of them in a responsible manner.

Inappropriate angling practices

Five records described a Platypus being found dead with a fishing hook embedded in its bill or the webbing of a front foot. Whenever possible, anglers are urged to move a short distance upstream or downstream of a Platypus seen swimming in the vicinity, to reduce the likelihood that the animal becomes inadvertently snagged on a hook. If a hook does become lodged in a foot or bill, the line should not be cut. Instead, the animal should be reeled in gently and the hook removed before the Platypus is released (taking great care to avoid the animal's spurs in the case of adult males).

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One hundred years ago

EXCURSION TO WEST WARBURTON A.D. Hardy

Crossing the Yarra by a substantial bridge, we found a somewhat steep road, mostly formed by side-cutting, leading up the mountain side. Down below ran the Dee, a foaming, rushing rivulet, so embowered in vegetation as to be scarcely visible. Stately tree-ferns, many very tall, with fine specimens of the King fern, Osmunda Barbara, took advantage of the cool, sheltered position, and enhanced the scene with their ever graceful fronds. The climbers Lyonsia and Tecoma entwined the blackwoods, prostantheras and dogwoods, and at every turn some fresh arrangement of foliage delighted the eye. At length we reached a plateau, where had formerly been a sawmill, and, getting directions from a resident, started along a disused timbertram towards the Rock, which we had decided was to be our goal for the day. The first evergreen Beech, Fagus Cunninghami, was encountered at an altitude of 1,000 feet, and to this height the proscribed Rubus has gained a footing along the roadway. The mountain side has been selected and denuded of timber. This belt is about two miles wide. Above it the forest area has also been cleared, partly by legitimate cutting and partly by bush fires. Many years ago the wastefulness of the timber-getter was, in the midst of plenty, and under an old system, hardly observable, but from the standpoint of the system of the last few years, and with timber fast disappearing, the thousands of whitened trunks which lie where they fell, or slid to when cut, caused us to indulge in much useless regret. To-day active watchful foresters traverse the timber lands to check illicit cutting and grazing, and, among much else, even examine the refuse heaps, at the mills to see that every available foot of the logs is made use of, hence waste is now almost reduced to its minimum. When climbing about these mountain sides, forcing one's way through almost impenetrable scrub and over huge tree trunks, one realizes far better than from the comfort of an easy chair the area to be covered, the difficulties of travel-often by saddle impracticable-and the comparative fewness of the officers for the purpose.

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